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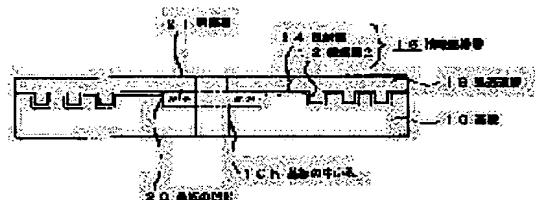
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(54) METHOD AND DEVICE FOR PRODUCTION OF OPTICAL RECORDING MEDIUM

(57)Abstract:

PROBLEM TO BE SOLVED: To uniformize the thickness of a light transmissive layer and to make recording high dense by applying an photosetting resin from the center part of rotation, spreading by the rotation and photosetting on a surface made flat by embedding a plugging plate in a center hole and a recessed part of the center part of a substrate.

SOLUTION: The substrate 10 is molded by injection-molding a polycarbonate and simultaneously fine ruggedness 12 and the circuit recessed part 20 of the substrate are formed. The recessed part 20 is set to, for example, 30 mm diameter and 0.3 mm depth. An information recording layer 15 is formed by adhering a reflecting layer 14 on the fine ruggedness by Al vapor deposition. The plugging plate 21 composed of the polycarbonate is inserted into the recessed part 20. In such a case, the thickness of the plugging plate 21 is set so that the upper surface of the inserted plugging plate 21 is leveled with the substrate or slightly projected over the substrate 10. The liquid photosetting resin is dropped on the center of the plugging plate 21 and is spread by the high speed rotation of the substrate 10. At the same time, the light transmissive layer 18 is formed by irradiating with ultraviolet ray and photosetting. The center hole 10h of the substrate is formed by punching the center part of the plugging plate 21.



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CLAIMS

[Claim(s)]

[Claim 1] The lock out plate which embeds this crevice in the above-mentioned crevice is inserted in using the substrate with which the crevice is formed in the periphery of a feed hole. By rotating the above-mentioned coalesce substrate for this photo-setting resin by dropping a photo-setting resin at the process used as a coalesce substrate, and the core of this coalesce substrate The manufacture approach of the optical record medium characterized by having the process which forms a light transmission layer by making it extend and carrying out photo-curing, and the process which a core is pierced [process] and makes a feed hole penetrate.

[Claim 2] The manufacture approach of the optical record medium according to claim 1 characterized by carrying out photo-curing of the photo-setting resin dropped at the core of the above-mentioned coalesce substrate to coincidence in the process which carries out rotation extension.

[Claim 3] The manufacture approach of the optical record medium according to claim 1 characterized by being inside the most inner circumference of the detailed irregularity from which the periphery of the crevice of the transparency substrate currently formed in the periphery of the above-mentioned feed hole constitutes the information record layer formed on the above-mentioned transparency substrate.

[Claim 4] The manufacture approach of an optical record medium according to claim 1 that the depth of the crevice of the transparency substrate currently formed in the periphery of the above-mentioned feed hole is characterized by being 0.3mm or less.

[Claim 5] The lock out plate which blockades the feed hole of this substrate is inserted in using the substrate which has a feed hole. By rotating the above-mentioned coalesce substrate for this photo-setting resin by dropping a photo-setting resin at the process used as a coalesce substrate, and the core of this coalesce substrate The manufacture approach of the optical record medium characterized by having the process made to extend, the process which removes the above-mentioned lock out plate during rotation of a coalesce substrate, and the process which forms a light transmission layer by carrying out photo-curing of the above-mentioned photo-setting resin.

[Claim 6] The manufacture approach of the optical record medium according to claim 5 characterized by adsorbing the above-mentioned lock out plate with a magnet in the process which removes the above-mentioned lock out plate.

[Claim 7] The manufacture approach of the optical record medium according to claim 5 characterized by carrying out photo-curing of the above-mentioned photo-setting resin, and forming a light transmission layer during rotation of a coalesce substrate after the process which removes the above-mentioned lock out plate.

[Claim 8] The manufacturing installation of the optical record medium which serves as a level pedestal which has the function to rotate a substrate horizontally, a lock out plate which blockades the feed hole of a substrate, and an electromagnet which has the function which carries out desorption of this lock out plate from a substrate from a lamp, and is characterized by considering the above-mentioned electromagnet and the nozzle which trickles a liquefied photo-setting resin on a substrate as the exchangeable configuration.

[Claim 9] The manufacturing installation of the optical record medium according to claim 8 characterized by the above-mentioned lock out plate being a magnetic material.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the manufacture approach of an optical record medium, and a manufacturing installation.

[0002]

[Description of the Prior Art] As an optical record medium which records the various information on the object for audios, and the object for videos and others Although there are optical record media, such as ROM (Read Only Memory) molds, such as an optical disk which performs the record or playback by optical exposure, an optical card, a magneto-optic disk, and a phase change optical record medium, a postscript mold, and a rewriting mold For example, detailed irregularity, such as a phase pit where record of the data information of the information record layer, a tracking servo signal, etc. is made in a ROM mold [as / in a compact disk], and PURIGURUBU, is formed by injection molding.

[0003] With increase-izing of the amount of recording information, high recording density-ization needed to be attained and numerical-aperture N.A. of the objective lens of an optical pickup needed to be enlarged as much as possible by this. Thus, since spacing of an objective lens and an information record layer needs to be selected small and the inclination tolerance of an optical record medium decreases in this case when enlarging numerical-aperture N.A. of an objective lens, the optical exposure to an information record layer will be made from the light transmission layer side formed on this, and, moreover, it will be necessary to set thickness of this light transmission layer to 0.5mm or less enough at smallness.

[0004] The outline sectional view of read-out of recording information or the optical record medium of a configuration of performing writing is shown from the light transmission layer [which was produced by the conventional process to drawing 20] side formed on the information record layer.

[0005] The optical record medium shown in drawing 20 has the configuration which the imprint of the detailed irregularity 2 was made while forming the substrate 1 with injection molding, and formed the reflective film 4 by aluminum vacuum evaporationo film to the detailed irregularity 2 after that, and formed the information record layer 5, and the thickness of 0.5mm or less formed light transmission layer 8 on the information record layer 5.

[0006] The production approach of the optical record medium shown in drawing 20 is shown below.

[0007] First, as detailed irregularity 2 is imprinted to shaping of a substrate 1 and coincidence by injection molding, next it is shown in drawing 21 , the light transmission layer 8 shown in drawing 20 is formed in the information record layer 5 forming-face side of a substrate 1 for the liquid photo-setting resin 3 from a nozzle 9 by applying circularly, extending by rotating a substrate 1 after that, and carrying out photo-curing of this.

[0008] The optical exposure of the read-out light L performs read-out of the information from the information record layer 5 to the optical record medium shown in this drawing 20 from the light transmission layer 8 side.

[0009]

[Problem(s) to be Solved by the Invention] As mentioned above, the liquid photo-setting resin 3 on a substrate 1 however, carry out rotation spreading circularly and for example, by carrying out photo-curing If the light transmission layer 8 is formed, the liquid photo-setting resin 3 inclines toward the outermost periphery on a substrate 1 according to a centrifugal force, thereby, as shown in drawing 20 , the outermost periphery on a substrate 1 will be thicker than the inner circumference section, the light transmission layer 8 will be formed, and an ununiformity will arise in the thickness of the light transmission layer 8.

[0010] Thus, if the thickness of the light transmission layer 8 becomes an ununiformity, in the case of record playback of the signal by the optical pickup of an optical record medium, it will become the cause which produces the aberration of a condensing spot, and degradation of a record regenerative signal will be produced.

[0011] Here, when applying a liquid photo-setting resin on a substrate, the relation between the distance (r0) from the substrate core of the spreading starting position of a photo-setting resin and distribution of the thickness of a light transmission layer is shown in drawing 22 . In measuring the relation between the distance (r0) from the substrate core of the spreading starting position of the photo-setting resin shown in drawing 22 , and distribution of the thickness of a light transmission layer, the distance (r0) from the substrate core of the spreading starting position of a photo-setting resin shows the distribution at the time of making it move at 5 (mm) spacing in 5-25 (mm). The photo-setting resin used SD-301 (Dainippon Ink make). Moreover, the rotation pattern of the substrate at the time of carrying out rotation extension of the photo-setting resin is shown in drawing 23 .

[0012] In drawing 22 , a curve 31 expresses distribution of the thickness (micrometer) of a light transmission layer in case the distance (r0) from the substrate core of the spreading starting position of a photo-setting resin is 5 (mm) here. a curve 32 -- $r - 0 = 10$ (mm) and a curve 33 -- $r - 0 = 15$ (mm) and a curve 34 -- $r - 0 = 20$ (mm) and a curve 35 -- $r - 0 = 25$ (mm) is expressed.

[0013] According to drawing 22 , it turns out that small distribution of the light transmission thickness difference of an inside-and-outside periphery is acquired, so that the spreading starting position (r0) of a photo-setting resin goes to the inner circumference side of a substrate. For example, the difference of the thickness in the inside-and-outside periphery of a light transmission layer in case a spreading starting position is 5 (mm) is set to 1 micrometer or less to the difference of the thickness in the inside-and-outside periphery of a light transmission layer in case a spreading starting position is 20 (mm) being 7 micrometers or more. Thus, the spreading starting position of a photo-setting resin is further brought to the inner circumference side of a substrate, when it is applying a photo-setting resin from the core of a substrate, a thickness difference twists a theory top and a plane light transmission layer will be obtained completely.

[0014] However, since there was a press slot by the stamper for the detailed irregularity imprint of an optical record medium which was produced on the occasion of the feed hole of a disk and injection molding of a substrate especially in the case of the optical disk, the spreading starting position of a photo-setting resin could not be made into the core of a substrate, but the outside of the press slot on the stamper was the limitation of the spreading starting position of a photo-setting resin. For this reason, unevenness was to arise in the thickness of a light transmission layer.

[0015] Then, in this invention, the optical record medium which avoided effectively as unevenness arose in the thickness of a light transmission layer by the ability making the spreading starting position of the photo-setting resin on a substrate at the time of forming a light transmission layer into the core of a substrate is produced.

[0016]

[Means for Solving the Problem] This invention inserts in the crevice of a substrate the lock out plate which embeds a crevice and is blockaded using the substrate with which the crevice is formed in the periphery of a feed hole. By considering as a coalesce substrate and a photo-setting resin being dropped at the core of this coalesce substrate, and making a photo-setting resin extend and carrying out photo-curing by rotating a coalesce substrate, form a light transmission layer, pierce a core, a feed hole is made

to penetrate, and an optical record medium is produced.

[0017] Moreover, by inserting a lock out plate in the feed hole of a substrate, considering as a coalesce substrate, a photo-setting resin being dropped at the core of this coalesce substrate, and carrying out rotation extension, removing a lock out plate during rotation of a coalesce substrate, and carrying out photo-curing of the photo-setting resin, this invention forms a light transmission layer and produces an optical record medium.

[0018] Since according to this invention a photo-setting resin is dropped, rotation spreading is carried out and a light transmission layer is formed in the core of a substrate by [the] carrying out glory hardening, the very small namely, optical record medium with small thickness unevenness of the thickness distribution of the light transmission layer of the inside-and-outside periphery of a substrate is producible.

[0019]

[Embodiment of the Invention] The gestalt of concrete operation of this invention is explained. Although the case where it applies to the shape of a disk and the so-called disc-like optical disk below is explained, this invention is not restricted to such an optical disk, has a magneto-optic disk, a phase change disk, and other detailed irregularity in an information record layer, and if informational playback or record is performed by carrying out focusing of the light to an information record layer through a light transmission layer, it can apply them about anythings.

[0020] This invention obtains the optical record medium of a configuration of being shown in drawing 1. That is, the optical record medium shown in drawing 1 imprints detailed irregularity 12 to shaping of a substrate 10 and coincidence, and has after that the configuration which formed the reflective film 14 by aluminum vacuum evaporationo film to the detailed irregularity 12, and formed the information record layer 15, and the thickness of 0.5mm or less formed light transmission layer 18 on the information record layer 15.

[0021] The production approach in this invention of the optical record medium shown in drawing 1 is shown below.

[0022] In this example, the lock out plate 21 which embeds a crevice 20 and is blockaded is inserted in the crevice 20 of a substrate 10 with which the crevice is formed in the periphery of 10h of feed holes. By considering as a coalesce substrate and a photo-setting resin being dropped at the core of this coalesce substrate, and making a photo-setting resin extend and carrying out photo-curing by rotating a coalesce substrate, form the light transmission layer 18, pierce a core, 10h of feed holes is made to penetrate, and an optical record medium is obtained.

[0023] First, the substrate 10 with which the crevice is formed in the periphery of a feed hole is produced. Drawing 2 is the outline sectional view of an example of substrate production equipment. In this example, for example with injection molding of light transmission nature resin, such as a polycarbonate, a substrate 10 is fabricated, the detailed irregularity 12 which constitutes the information record layer 15 in shaping of a substrate 10 and coincidence is formed, and the crevice 20 of a substrate is further formed in a substrate 10.

[0024] The substrate production equipment shown in drawing 2 comes to have metal mold equipment 53 which consists of substrate side metal mold 51 which constitutes the cavity 50 for fabricating a substrate 10, and which consists of a stainless steel system metal, for example, and stamper side metal mold 52. The stamper side metal mold 52 is connected with the gate 80 of the light transmission nature resin transmitting mechanism 90 which sends out the light transmission nature resin fused in the cavity 50.

[0025] Light transmission nature resin is sent out to the gate 80 by preparing screw 40s in the light transmission nature resin transmitting mechanism 90, and making it rotate this screw 40s.

[0026] Substrate feed-hole punching pin 51a for finally piercing and forming 10h of feed holes of the shaping substrate 10 in a core is arranged at the substrate side metal mold 51.

[0027] The metal mold 40 with heights which forms the crevice 20 of the substrate 10 which it is arranged with a vacuum-chuck method, and is finally obtained is arranged for the stamper 7 which imprints the detailed irregularity 12 which constitutes the information record layer 15 of a substrate 10 in the stamper side metal mold 52 used in shaping of a substrate 10.

[0028] In the necessary location of the substrate 10 finally obtained, and the example of illustration, it is the periphery of 10h of feed holes of the information signal forming face of a substrate 10, and heights 40a for crevice formation of the shape of a ring of the necessary magnitude for forming a crevice 20 in the coldhearted news record section of the location inside an information record stratification field over the perimeter is prepared in the metal mold 40 with heights.

[0029] And to 40h of feed holes of the metal mold 40 with heights of the core of the metal mold 40 with heights, the gate 80 is open for free passage. Moreover, 7h of feed holes where heights 40a of the metal mold 40 with heights is inserted is drilled in the core of a stamper 7.

[0030] How to fabricate a substrate 10 is explained using this substrate production equipment.

[0031] First, the substrate side metal mold 51 and the stamper side metal mold 52 are made to agree, and a cavity 50 is formed among both. In this condition, light transmission nature resin, for example, a melting polycarbonate, is sent into the gate 80 by rotating screw 40s. Heat will be radiated and light transmission nature resin will be solidified, if it is slushed in a cavity 50 through 40h of feed holes of the metal mold 40 with heights after passing through the gate 80. Next, extrude substrate feed-hole punching pin 51a, it is made to project, 10h of feed holes of a substrate is formed, and a substrate 10 is obtained.

[0032] Thus, as shown in drawing 3, it is the periphery of 10h of feed holes of a substrate, and the substrate 10 with which heights 40a for crevice formation was imprinted by the coldhearted news record section of the location inside an information record stratification field, and the crevice 20 was formed in it is fabricated.

[0033] If the crevice 20 of this substrate 10 sets the path of the feed hole of a substrate 10 to 15 (mm), as for 30 (mm) and the depth, it is desirable that it is below 0.3 (mm), for example, that periphery can be selected to 0.2 (mm).

[0034] Next, the reflective film 14 by aluminum vacuum evaporationo film is put on the detailed irregularity 12 formed on the substrate 10 at injection molding and coincidence of a substrate 10, and the information record layer 15 is formed in it.

[0035] Next, the lock out plate 21 which embeds in the crevice 20 of a substrate and is blockaded is prepared. As it considers as a circle configuration and is shown in drawing 4, the lock out plate 21 which considering as a circular crevice is desirable as for the crevice 20 of a substrate 10, embeds this in this case, and is blockaded inserts the lock out plate 21 in the crevice 20 of a substrate 10, and forms the coalesce substrate 25 in it. This lock out plate 21 is produced with the same material as a substrate 10, for example, a polycarbonate. And the path of the lock out plate 21 is selected corresponding to the diameter of inner circumference of the crevice 20 of a substrate 10, and is selected by the magnitude exactly inserted in in a crevice 20. Moreover, it is in the condition inserted in in the crevice 20 of a substrate, and the thickness of this lock out plate 21 is the same as the depth of a crevice 20, or slightly larger than the depth of the crevice 20 of a substrate, therefore when it inserts in a crevice 20, it is selected so that it may project more slightly than a substrate side, so that that front face may form the same flat surface as a substrate side.

[0036] Next, as shown in drawing 5, the liquefied photo-setting resin 3 is dropped by the nozzle 9 on the core of the lock out plate 21 inserted in the crevice 20 of a substrate 10 in the core of a substrate 10, i.e., this case.

[0037] Next, as shown in drawing 6, high-speed rotation of the substrate 10 is carried out, and the liquefied photo-setting resin 3 is extended. At this time, the UV irradiation by the light source 22 can perform photo-curing of the liquefied photo-setting resin 3 at the extension and coincidence of the liquefied photo-setting resin 3 by rotation of a substrate 10, and the light transmission layer 18 finally obtained can be produced.

[0038] Thus, by having considered as the configuration which inserted the lock out plate 21 in the crevice 20 of a substrate 10, from the core of a substrate 10, as a photo-setting resin 3 can be dropped now and the measurement result which this explained in above-mentioned drawing 22 was shown, the thickness of the light transmission layer 18 can be formed in homogeneity.

[0039] Next, as shown in drawing 7, the feed-hole punching machine 71 can be inserted from the core

of a substrate 10, and the light transmission layer 18 and the lock out plate 21 which were made to carry out photo-curing of the lock out plate 21 and the photo-setting resin 3, and formed them are pierced, it can be made to be able to penetrate, 10h of feed holes of a substrate 10 can be formed, and the optical record medium finally made into the purpose can be obtained.

[0040] Moreover, when making the core of a substrate 10 penetrate and forming 10h of feed holes of a substrate 10, as shown in drawing 8, from the light transmission layer 18 forming-face side of a substrate 10, the feed-hole punching machine 71 is driven in, the light transmission layer 18 and a lock out plate are pierced, it can be made to be able to penetrate and 10h of feed holes of a substrate 10 can also be formed.

[0041] The very small optical record medium of the thickness distribution of the light transmission layer 18 which performs informational read-out or the informational writing from the information record layer 15 is [in / as mentioned above / the production process of the light transmission layer 18] producible by taking the approach of applying a photo-setting resin 3, making carry out rotation extension in the condition of having made 10h of feed holes of a substrate 10 blockading with the lock out plate 21, and carrying out photo-curing.

[0042] Next, other examples which produce the optical record medium of very small namely, uniform thickness of the thickness distribution of a light transmission layer are explained with reference to drawing 9 - drawing 15.

[0043] The schematic diagram of the manufacturing installation of the optical record medium of this invention is shown in drawing 9. The manufacturing installation of this optical record medium consists the level pedestal 100 which has the medial axis 101 penetrated to the feed hole of a substrate, and has a rotation function for this medial axis horizontally as a core, the lock out plate 121 which blockades 10h of feed holes of a substrate, and this lock out plate 121 of a lamp L for hardening the electromagnet 102 in which desorption is possible, and a photo-setting resin from a substrate 10.

[0044] This lock out plate 121 has the outer diameter which becomes size, and protrusion supporter 121a inserted in 10h of feed holes is prepared, and it changes from the bore of 10h of feed holes of a substrate to that inferior surface of tongue. As for the lock out plate 121 or protrusion supporter 121a, a part of either [at least] is constituted by the magnetic substance at least. For example, the lock out plate 121 can apply and constitute a magnetic material to the resin plate which constituted with the magnetic metal plate or was produced, for example with injection molding. This lock out plate 121 sets that thickness to 0.1mm or less preferably about 0.3mm or less.

[0045] Moreover, as it is indicated in drawing 15 as this electromagnet 102 and the nozzle 9 which trickles a liquefied photo-setting resin on a substrate 10, it considers as the exchangeable configuration.

[0046] For example, on the revolving-shaft section 131, a nozzle 9 and an electromagnet 102 change a nozzle 9 and an electromagnet 102 as structure which one is made to rotate, and it has them in the core of a substrate 10, and they are made to be caused. On the other hand, it is made as [convey / by the conveyance means 130 / two or more substrates 10].

[0047] Moreover, anything of the configuration of circular and linearity can be used for the configuration of Lamp L. This lamp L is arranged rather than the lock out plate 121 at the periphery side of a substrate 10, and is arranged in the location in which an optical exposure is possible enough also at the outermost periphery of a substrate 10.

[0048] An optical record medium is produced using above-mentioned this invention equipment. First, as shown in drawing 10, one substrate 10 turns an information record layer up, and is conveyed by the conveyance means 130 above the level pedestal 100. And although it does not illustrate while the level pedestal 100 goes up and the medial axis 101 is inserted all over 10h of feed holes of a substrate 10, adsorption installation of the substrate 10 is carried out on the level pedestal 100 by the vacuum chuck prepared in the level pedestal 100.

[0049] While the lock out plate 121 by which the electromagnet 102 was adsorbed has above the core of the substrate 10 on the level pedestal 100 on the other hand at this time, being caused and inserting that protrusion supporter 121a into 10h of feed holes of a substrate, the lock out plate 121 attaches to the upper limit side of 10h of feed holes of a substrate, and blockades this. And where this lock out is made,

the energization to an electromagnet 102 is severed, after the lock out plate 121 has blockaded 10h of feed holes of a substrate 10, it coalesces, and the coalesce substrate 125 is constituted.

[0050] Next, as shown in drawing 11, an electromagnet 102 is moved, the nozzle 9 which supplies a photo-setting resin instead is installed above a substrate 10, and a photo-setting resin is dropped at the core of the coalesce substrate 125 from a nozzle 9.

[0051] Then, a nozzle 9 is moved and an electromagnet 102 is instead installed above a substrate 10 again.

[0052] Next, as shown in drawing 12, extension spreading is uniformly carried out by rotating [the photo-setting resin dropped on this coalesce substrate 125] the rotation pedestal 100 for the coalesce substrate 125.

[0053] Then, as shown in drawing 13, the lock out plate 121 is adsorbed with an electromagnet 102 during rotation of the coalesce substrate 125, and it removes from the coalesce substrate 125.

[0054] Next, as shown in drawing 14, photo-curing of the photo-setting resin is carried out with Lamp L, and the light transmission layer which constitutes the optical record medium finally obtained is formed.

[0055] The process mentioned above can be continuously performed repeatedly by having a substrate 10 on the level pedestal 100 one by one, and causing it with the conveyance means 130, as drawing 15 explained. And according to the above-mentioned configuration, the migration shift of the nozzle 9 which carries out supply dropping of the photo-setting resin, and the electromagnet 102 which performs adsorption of the lock out plate 121 and desorption can be quickly carried out on the core of a substrate 10 by having considered as the structure rotated to one.

[0056] In an above-mentioned example, although what applied magnetic powder to the metal plate with a thickness of about 0.3mm and the resin plate produced by carrying out injection molding of the photo-setting resin can be used for the lock out plate 121 shown in drawing 9, since it is necessary to use this lock out plate 121 repeatedly, the reinforcement which can be equal to repeat use is required. For this reason, it is necessary to make this lock out plate 121 to some extent thick.

[0057] Then, since it can avoid that the lock out plate 121 projects too much from a substrate also when a substrate 10 and the lock out plate 121 are made to agree and a coalesce substrate is formed, as shown in drawing 17 if crevice 10a is beforehand formed on the outskirts of a core of a substrate 10 as shown in drawing 16, the to some extent thick lock out plate 121 can be used. However, it is desirable in the depth of crevice 10a of this substrate being selected in this case more shallowly than the thickness of the lock out plate 121. For example, if thickness of a substrate 10 is set to 1.2mm and the depth of substrate crevice 10a is set to 0.3mm, thickness of the lock out plate 121 can be set to about 0.4mm.

[0058] Moreover, in the example mentioned above, as shown in drawing 18, by attaching an O ring or packing in the contact section of the lock out plate 121 and a substrate 10, it can prevent that a photo-setting resin invades between a substrate 10 and the lock out plate 121, and, thereby, the spreading unevenness of a photo-setting resin and the poor appearance of an optical record medium which are finally acquired can be avoided.

[0059] Moreover, if it is the condition of carrying out line contact with the side-attachment-wall section of 10h of feed holes of a substrate when the side face of the lock out plate 121 is made into the shape of a taper and 10h of feed holes of a substrate 10 is embedded, as shown in drawing 19, since a clearance will not be made between a substrate 10 and the lock out plate 121, invasion of a photo-setting resin is avoidable.

[0060] In an above-mentioned example, although the reflective film 14 of the information record layer 15 which constitutes the optical record medium of this invention was formed with aluminum vacuum evaporationo film, this invention is not limited to this example and it can also apply metals, such as Au.

[0061] Moreover, although the case where the optical record medium of monolayer structure was produced was explained in the example mentioned above This invention by adding the process which makes the stamper for a detailed irregularity imprint which constitutes an information record layer agree, after applying a photo-setting resin 3 on the above-mentioned substrate 10, and making a light transmission layer form like the example further mentioned above after that It can apply, when

producing the optical record medium of two-layer structure or the multilayer structure which has an information record layer more than it.

[0062]

[Effect of the Invention] According to this invention, since the light transmission layer which performs read-out of the recording information from the information record layer of an optical record medium or informational writing was made to form through the process which trickles into the core of a substrate and carries out rotation extension when forming by carrying out photo-curing of the liquefied photo-setting resin, light transmission **** could be thinly formed in uniform thickness, and high recording density-ization of an optical record medium was able to be attained.

[0063] Moreover, while making the liquefied photo-setting resin extend by rotation of a substrate, it was effectively avoidable by stiffening a photo-setting resin by optical exposure that distribution arises in the thickness of the light transmission layer from which a photo-setting resin is finally obtained with the surface tension.

[0064] Moreover, it was avoidable to produce a defect in an information record layer by forming inside the most inner circumference of the detailed irregularity which constitutes the information record layer formed on the substrate in the periphery of the crevice of a substrate.

[0065] The thickness of the lock out plate for embedding the crevice of a substrate moreover, by making it form more thickly than the depth of the crevice of a substrate, and the depth of abbreviation identitas or a crevice In the condition of having embedded the lock out plate at the substrate, when applying a liquefied photo-setting resin and extending by this that it will be in the condition that the core of a substrate became depressed by the ability avoiding, the substrate core was covered with the liquefied photo-setting resin, and it was able to avoid that it will be in the condition that extension is barred.

[0066] Moreover, the thickness of the lock out plate 21 which embeds the crevice of a substrate can be set up thinly, and it was able to make it possible to pierce the feed hole of a substrate easily by this by selecting the depth of the crevice of a substrate below to 0.3 (mm).

[0067] Moreover, the production process of an optical record medium can be performed now more simply and quickly by inserting in the feed hole of a substrate and performing desorption of a lock out plate during rotation of a coalesce substrate using the ingredient which has magnetism as a lock out plate which blockades this.

[0068] Moreover, according to the manufacturing installation of the optical record medium of this invention, the light transmission layer which constitutes an optical record medium was able to be formed in thin and uniform thickness simply and quickly.

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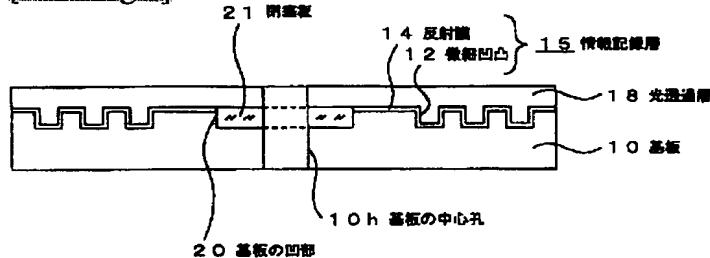
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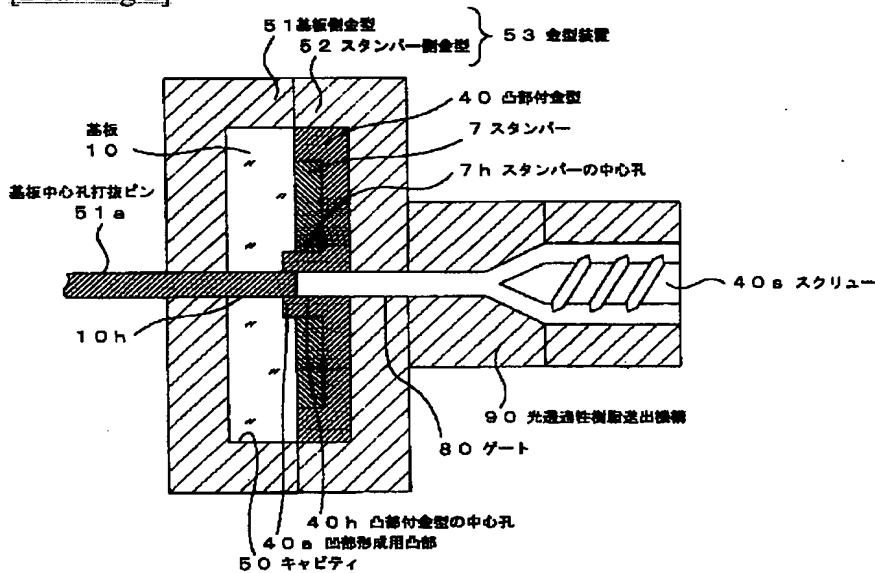
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DRAWINGS

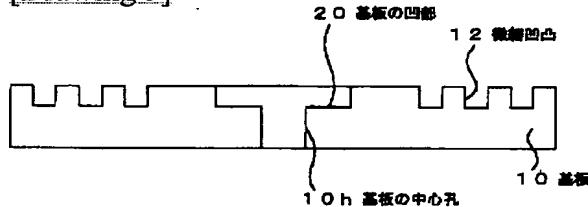
[Drawing 1]



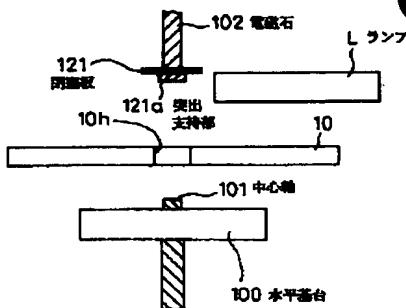
[Drawing 2]



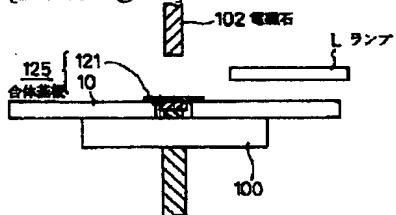
[Drawing 3]



[Drawing 9]



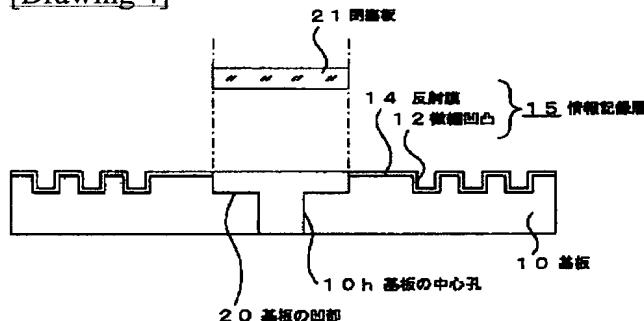
[Drawing 10]



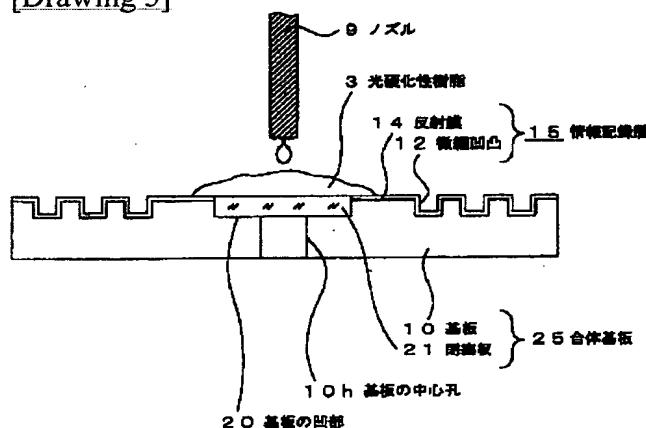
[Drawing 18]



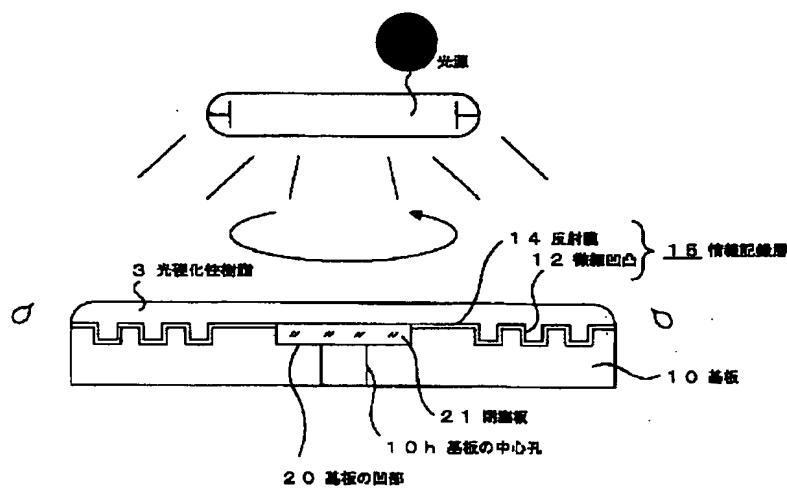
[Drawing 4]



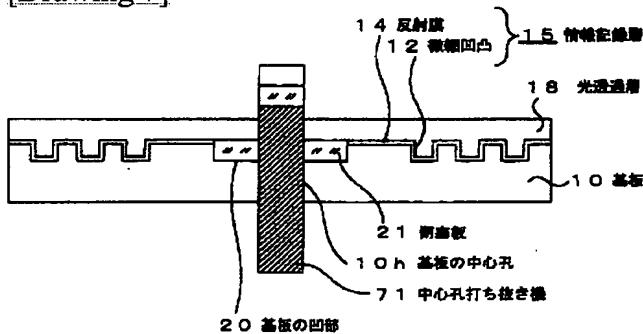
[Drawing 5]



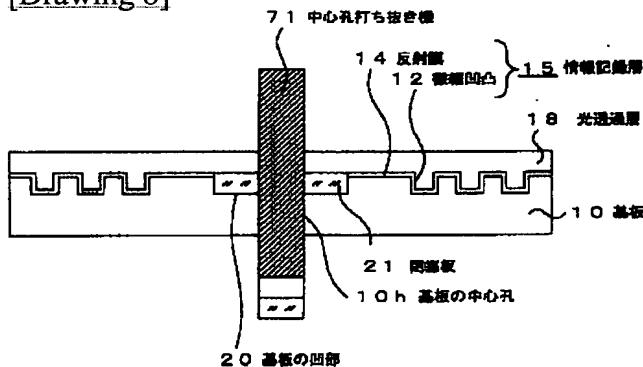
[Drawing 6]



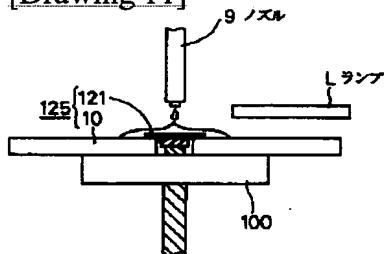
[Drawing 7]



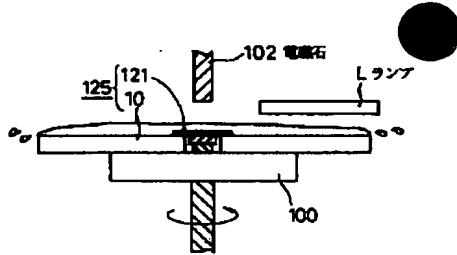
[Drawing 8]



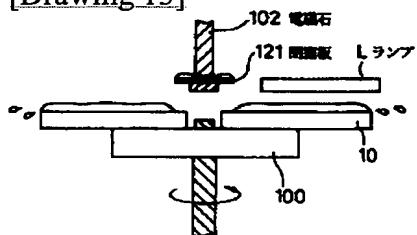
[Drawing 11]



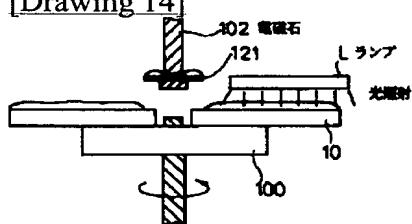
[Drawing 12]



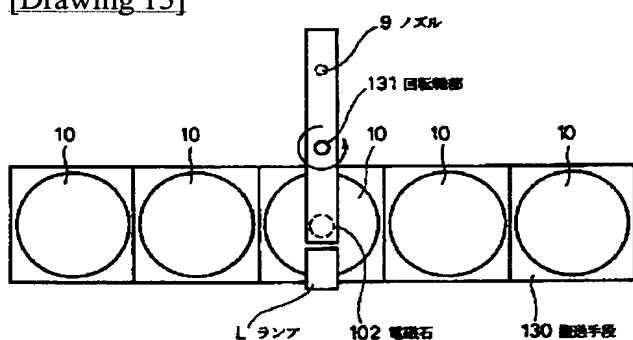
[Drawing 13]



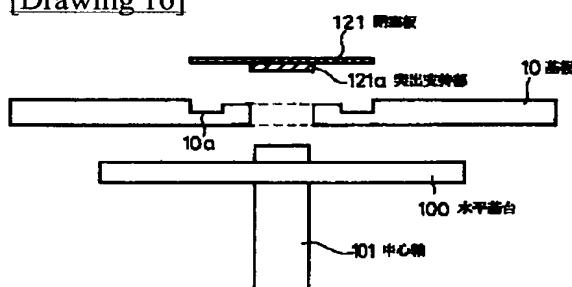
[Drawing 14]



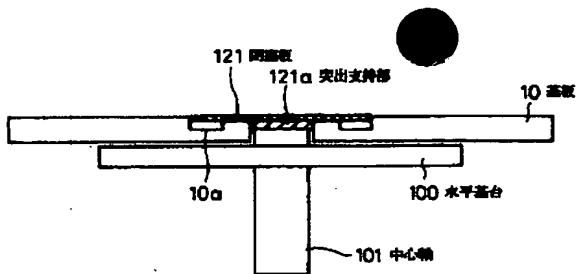
[Drawing 15]



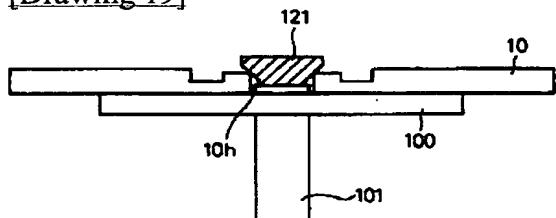
[Drawing 16]



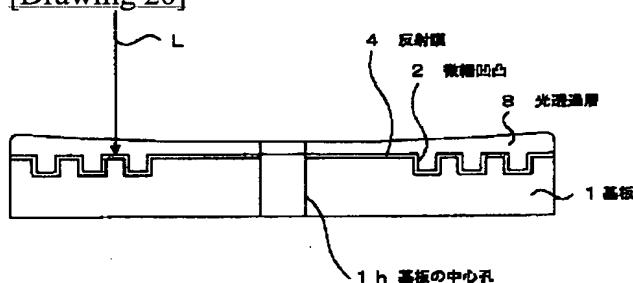
[Drawing 17]



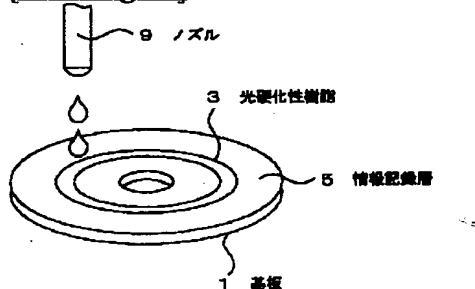
[Drawing 19]



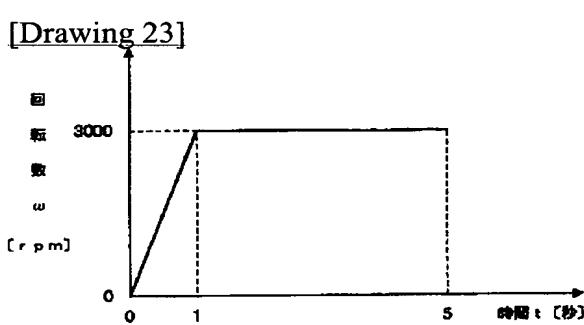
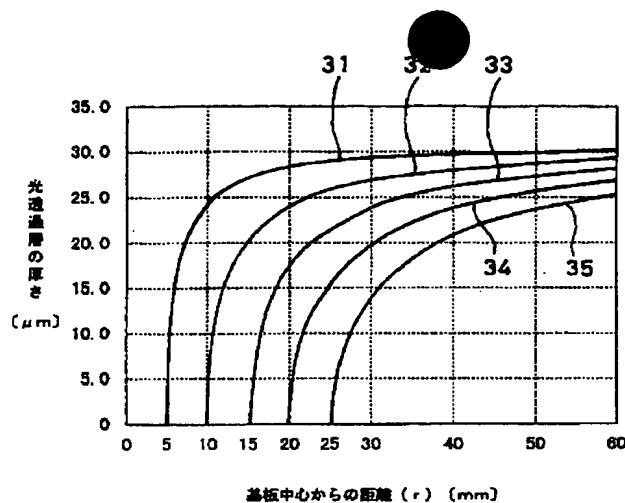
[Drawing 20]



[Drawing 21]



[Drawing 22]



[Translation done.]

* NOTICES *

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2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CORRECTION OR AMENDMENT

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 [Procedure amendment 1]
 [Document to be Amended] Specification
 [Item(s) to be Amended] Claim
 [Method of Amendment] Modification
 [The contents of amendment]
 [Claim(s)]
 [Claim 1]
 The substrate with which the crevice is formed in the periphery of a feed hole is used,
 The process which inserts in the above-mentioned crevice the lock out plate which embeds this crevice,
 and is used as a coalesce substrate,
 The process which forms a light transmission layer by dropping a photo-setting resin at the core of this coalesce substrate, making this photo-setting resin extend by rotating the above-mentioned coalesce substrate, and carrying out photo-curing,
 The manufacture approach of the optical record medium characterized by piercing a core and having the process which makes a feed hole penetrate.
 [Claim 2]
 The manufacture approach of the optical record medium according to claim 1 characterized by carrying out photo-curing of the photo-setting resin dropped at the core of the above-mentioned coalesce substrate to coincidence in the process which carries out rotation extension.
 [Claim 3]

The manufacture approach of the optical record medium according to claim 1 characterized by being inside the most inner circumference of the detailed irregularity from which the periphery of the crevice of the transparency substrate currently formed in the periphery of the above-mentioned feed hole constitutes the information record layer formed on the above-mentioned transparency substrate.

[Claim 4]

The manufacture approach of an optical record medium according to claim 1 that the depth of the crevice of the transparency substrate currently formed in the periphery of the above-mentioned feed hole is characterized by being 0.3mm or less.

[Claim 5]

The process which inserts in the lock out plate which blockades the feed hole of this substrate using the substrate which has a feed hole, and is used as a coalesce substrate,

The process made to extend by dropping a photo-setting resin at the core of this coalesce substrate by rotating the above-mentioned coalesce substrate for this photo-setting resin,

The process which removes the above-mentioned lock out plate,

The manufacture approach of the optical record medium characterized by having the process which forms a light transmission layer by carrying out photo-curing of the above-mentioned photo-setting resin.

[Claim 6]

The process which inserts in the lock out plate which blockades the feed hole of this substrate using the substrate which has a feed hole, and is used as a coalesce substrate,

The process made to extend by dropping a photo-setting resin at the core of this coalesce substrate by rotating the above-mentioned coalesce substrate for this photo-setting resin,

The process which removes the above-mentioned lock out plate during rotation of the above-mentioned coalesce substrate,

The manufacture approach of the optical record medium characterized by having the process which forms a light transmission layer by carrying out photo-curing of the above-mentioned photo-setting resin.

[Claim 7]

In the process which removes the above-mentioned lock out plate,

The manufacture approach of the optical record medium according to claim 5 or 6 characterized by adsorbing the above-mentioned lock out plate with a magnet.

[Claim 8]

The manufacture approach of the optical record medium according to claim 5 or 6 characterized by carrying out photo-curing of the above-mentioned photo-setting resin, and forming a light transmission layer during rotation of a coalesce substrate after the process which removes the above-mentioned lock out plate.

[Claim 9]

The level pedestal which has the function to rotate a substrate horizontally,

The lock out plate which blockades the feed hole of a substrate,

The electromagnet which has the function which carries out desorption of this lock out plate from a substrate,

It consists of a lamp,

The manufacturing installation of the optical record medium characterized by considering the above-mentioned electromagnet and the nozzle which trickles a liquefied photo-setting resin on a substrate as the exchangeable configuration.

[Claim 10]

The manufacturing installation of the optical record medium according to claim 9 characterized by the above-mentioned lock out plate being a magnetic material.

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0002

[Method of Amendment] Modification

[The contents of amendment]

[0002]

[Description of the Prior Art]

Although there are optical record media, such as ROM (Read Only Memory) molds, such as an optical disk which performs the record or playback by optical exposure, an optical card, a magneto-optic disk, and a phase change optical record medium, a postscript mold, and a rewriting mold, as an optical record medium which records the various information on the object for audios, and the object for videos and others, the phase pit where the data information of the information record layer and record are made in a ROM mold [as / in a compact disk], and detailed irregularity are formed by injection molding, for example.

[Procedure amendment 3]

[Document to be Amended] Specification

[Item(s) to be Amended] 0003

[Method of Amendment] Modification

[The contents of amendment]

[0003]

With increase-izing of the amount of recording information, high recording density-ization needed to be attained and numerical-aperture N.A. of the objective lens of an optical pickup needed to be enlarged as much as possible by this. Thus, since the inclination tolerance of an optical record medium decreases when enlarging numerical-aperture N.A. of an objective lens, the optical exposure to an information record layer will be made from the light transmission layer side formed on this, and, moreover, it will be necessary to set thickness of this light transmission layer to 0.5mm or less enough at smallness.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0019

[Method of Amendment] Modification

[The contents of amendment]

[0019]

[Embodiment of the Invention]

The gestalt of concrete operation of this invention is explained.

Although the case where it applies to the optical disk which named generically the shape of a disk, the so-called disc-like magneto-optic disk, the phase change disk, the ROM disk, etc. below is explained, this invention is not restricted to such an optical disk, has detailed irregularity in an information record layer, and if informational playback or record is performed by carrying out focusing of the light to an information record layer through a light transmission layer, it can apply it about anythings.

[Translation done.]

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(54)【発明の名称】 光学記録媒体の製造方法および製造装置

(57)【要約】

【課題】 情報の読み込み、あるいは書き込みを行う光
透過層を均一な厚さに形成する。

【解決手段】 基板の中心孔を閉塞板で閉塞して合体基
板とし、この合体基板の中心部に光硬化性樹脂を滴下し
て、回転延伸させ、光硬化することにより、光透過層を
形成する。

【特許請求の範囲】

【請求項1】 中心孔の周辺部に凹部が形成されている基板を用いて、

上記凹部に、該凹部を埋め込む閉塞板を嵌め込んで、合体基板とする工程と、

該合体基板の中心部に光硬化性樹脂を滴下して該光硬化性樹脂を、上記合体基板を回転することによって、延伸させ、光硬化することにより、光透過層を形成する工程と、

中心部を打ち抜いて、中心孔を貫通させる工程とを有することを特徴とする光学記録媒体の製造方法。

【請求項2】 上記合体基板の中心部に滴下した光硬化性樹脂を回転延伸する工程において、同時に光硬化することを特徴とする請求項1に記載の光学記録媒体の製造方法。

【請求項3】 上記中心孔の周辺部に形成されている透明基板の凹部の外周が、上記透明基板上に形成された情報記録層を構成する微細凹凸の最内周よりも、内側にあることを特徴とする請求項1に記載の光学記録媒体の製造方法。

【請求項4】 上記中心孔の周辺部に形成されている透明基板の凹部の深さが、0.3mm以下であることを特徴とする請求項1に記載の光学記録媒体の製造方法。

【請求項5】 中心孔を有する基板を用いて、該基板の中心孔を閉塞する閉塞板を嵌め込んで、合体基板とする工程と、

該合体基板の中心部に光硬化性樹脂を滴下して該光硬化性樹脂を、上記合体基板を回転することによって、延伸させる工程と、

合体基板の回転中に上記閉塞板を取り外す工程と、

上記光硬化性樹脂を光硬化することにより、光透過層を形成する工程とを有することを特徴とする光学記録媒体の製造方法。

【請求項6】 上記閉塞板を取り外す工程において、磁石により上記閉塞板を吸着することを特徴とする請求項5に記載の光学記録媒体の製造方法。

【請求項7】 上記閉塞板を取り外す工程の後、合体基板の回転中に、上記光硬化性樹脂を光硬化して光透過層を形成することを特徴とする請求項5に記載の光学記録媒体の製造方法。

【請求項8】 基板を水平方向に回転する機能を有する水平基台と、基板の中心孔を閉塞する閉塞板と、該閉塞板を基板から脱着する機能を有する電磁石と、ランプからなり、上記電磁石と、基板上に液状光硬化性樹脂を滴下するノズルとが、交換可能な構成とされていることを特徴とする光学記録媒体の製造装置。

【請求項9】 上記閉塞板が磁性材料であることを特徴とする請求項8に記載の光学記録媒体の製造装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、光学記録媒体の製造方法および製造装置に係わる。

【0002】

【従来の技術】 オーディオ用、ビデオ用その他の各種情報を記録する光学記録媒体として、その記録もしくは再生を光照射によって行う光ディスク、光カード、光磁気ディスク、相変化光学記録媒体等のROM (Read Only Memory) 型、追記型、書換え型等の光学記録媒体があるが、例えば、コンパクトディスクにおけるようなROM型においてその情報記録層のデータ情報、トラッキングサーボ信号等の記録がなされる位相ピット、ブリググループ等の微細凹凸は、射出成形によって形成される。

【0003】 記録情報量の増大化に伴い、高記録密度化を図る必要があり、これによって、光ピックアップの対物レンズの開口数N.A. をできるだけ大きくする必要が生じた。このように、対物レンズの開口数N.A. を大きくする場合、対物レンズと情報記録層との間隔は小さく選定される必要があり、また、この場合、光学記録媒体の傾き許容度が減少することから、情報記録層に対する光照射は、これの上に形成された光透過層側からなされ、しかも、この光透過層の厚さは充分小に、例えば0.5mm以下とする必要が生じている。

【0004】 図20に、従来製法により作製した、情報記録層上に形成された光透過層側から記録情報の読み出し、あるいは書き込みを行う構成の光学記録媒体の概略断面図を示す。

【0005】 図20に示す光学記録媒体は、基板1を射出成形によって形成すると同時に微細凹凸2の転写がなされ、その後、微細凹凸2に例えばA1蒸着膜による反射膜4を成膜し、情報記録層5を形成し、その情報記録層5上に、0.5mm以下の厚さの光透過層8形成した構成を有する。

【0006】 図20に示す光学記録媒体の作製方法を以下に示す。

【0007】 先ず、射出成形による基板1の成形と同時に微細凹凸2の転写を行い、次に、図21に示すように、基板1の情報記録層5形成面側に、ノズル9から液体光硬化性樹脂3を例えば円形に塗布し、その後、基板1を回転させることにより延伸し、これを光硬化することにより、図20に示した光透過層8を形成する。

【0008】 この図20に示す光学記録媒体に対する情報記録層5からの情報の読み出しは、光透過層8側から、読み出し光Lの光照射によって行う。

【0009】

【発明が解決しようとする課題】 しかしながら、上述したように、液体光硬化性樹脂3を基板1上に例えば円形に回転塗布して光硬化させることにより、光透過層8を形成すると、遠心力により液体光硬化性樹脂3が基板1上の最外周部に偏り、これにより、図20に示すよう

に、光透過層8が、基板1上の最外周部が内周部よりも厚く形成され、光透過層8の厚さに不均一が生じる。

【0010】このように光透過層8の厚さが不均一になると、光学記録媒体の光ピックアップによる信号の記録再生の際に、集光スポットの収差を生じる原因となり、記録再生信号の劣化を生じる。

【0011】ここで、基板上に液体光硬化性樹脂を塗布する場合に、光硬化性樹脂の塗布開始位置の基板中心からの距離(r_0)と、光透過層の厚さの分布との関係を図22に示す。図22に示した光硬化性樹脂の塗布開始位置の基板中心からの距離(r_0)と、光透過層の厚さの分布との関係を測定する場合には、光硬化性樹脂の塗布開始位置の基板中心からの距離(r_0)は5~25

(mm)の範囲で5(mm)間隔で移動させた場合の分布を示す。光硬化性樹脂はSD-301(大日本インキ社製)を使用した。また、光硬化性樹脂を回転延伸させる際の基板の回転パターンを図23に示す。

【0012】ここで、図22において、曲線31は、光硬化性樹脂の塗布開始位置の基板中心からの距離(r_0)が5(mm)のときの光透過層の厚さ(μm)の分布を表し、曲線32は $r_0=10$ (mm)、曲線33は $r_0=15$ (mm)、曲線34は $r_0=20$ (mm)、曲線35は $r_0=25$ (mm)のときのそれぞれの光透過層の厚さの分布を表す。

【0013】図22によれば、光硬化性樹脂の塗布開始位置(r_0)が基板の内周側に行くほど、内外周の光透過層厚差の小さい分布が得られることがわかる。例えば塗布開始位置が20(mm)のときの光透過層の内外周における厚さの差は7μm以上であるのに対し、塗布開始位置が5(mm)のときの光透過層の内外周における厚さの差は1μm以下となる。このように光硬化性樹脂の塗布開始位置をさらに基板の内周側に持っていく、基板の中心部から光硬化性樹脂を塗布することとすると、理論上は、膜厚差のない完全に平面の光透過層が得られることになる。

【0014】しかし、光学記録媒体の、特に光ディスクの場合には、ディスクの中心孔や、基板の射出成形の際に生じた微細凹凸転写用のスタンパーによる押圧溝があるため、光硬化性樹脂の塗布開始位置を基板の中心部とすることはできず、スタンパーの押圧溝の外側が光硬化性樹脂の塗布開始位置の限界であった。このため、光透過層の厚さにむらが生じることとなっていた。

【0015】そこで、本発明においては、光透過層を形成する際の、基板上の光硬化性樹脂の塗布開始位置を基板の中心部とすることができますようにして光透過層の厚さにむらが生じることを効果的に回避した光学記録媒体を作製する。

【0016】

【課題を解決するための手段】本発明は、中心孔の周辺部に凹部が形成されている基板を用いて、基板の凹部

に、凹部を埋め込んで閉塞する閉塞板を嵌め込んで、合体基板とし、この合体基板の中心部に光硬化性樹脂を滴下して、光硬化性樹脂を、合体基板を回転することによって、延伸させ、光硬化することにより、光透過層を形成し、中心部を打ち抜いて、中心孔を貫通させて、光学記録媒体を作製する。

【0017】また、本発明は、基板の中心孔に閉塞板を嵌め込んで、合体基板とし、この合体基板の中心部に光硬化性樹脂を滴下して回転延伸させ、合体基板の回転中に閉塞板を取り外し、光硬化性樹脂を光硬化することにより、光透過層を形成して光学記録媒体を作製する。

【0018】本発明によれば、基板の中心部に光硬化性樹脂を滴下して、回転塗布し、その後光硬化することにより光透過層を形成するため、基板の内外周の光透過層の厚さ分布の極めて小さいわち、厚さむらが小さい光学記録媒体を作製することができる。

【0019】

【発明の実施の形態】本発明の具体的な実施の形態について説明する。以下において、ディスク状、いわゆる円板状の光ディスクに適用する場合について説明するが、本発明はこのような光ディスクに限られるものではなく、光磁気ディスク、相変化ディスク、その他微細凹凸を情報記録層に有し、情報記録層に、光透過層を介して光をフォーカシングされることにより、情報の再生、あるいは記録を行うものであれば、いかなるものについても適用することができる。

【0020】本発明は、例えば図1に示す構成の光学記録媒体を得るものである。すなわち、図1に示す光学記録媒体は、基板10の成形と同時に微細凹凸12の転写を行い、その後、微細凹凸12に例えばA1蒸着膜による反射膜14を成膜して情報記録層15を形成し、その情報記録層15上に、0.5mm以下の厚さの光透過層18形成した構成を有する。

【0021】図1に示す光学記録媒体の本発明における作製方法を以下に示す。

【0022】この例においては、中心孔10hの周辺部に凹部が形成されている基板10を用いて、基板の凹部20に、凹部20を埋め込み閉塞する閉塞板21を嵌め込んで、合体基板とし、この合体基板の中心部に光硬化性樹脂を滴下して、光硬化性樹脂を、合体基板を回転することによって、延伸させ、光硬化することにより、光透過層18を形成し、中心部を打ち抜いて、中心孔10hを貫通させて、光学記録媒体を得る。

【0023】先ず、中心孔の周辺部に凹部が形成されている基板10を作製する。図2は、基板作製装置の一例の概略断面図である。この例においては、例えばポリカーボネート等の光透過性樹脂の射出成形によって、基板10の成形を行い、基板10の成形と同時に、情報記録層15を構成する微細凹凸12を形成し、さらに基板10に、基板の凹部20を形成する。

【0024】図2に示す基板作製装置は、基板10を成形するためのキャビティ50を構成する例えばステンレス系金属よりなる基板側金型51とスタンパー側金型52からなる金型装置53を有してなる。スタンパー側金型52は、キャビティ50内に溶融した光透過性樹脂を送り出す光透過性樹脂送出機構90のゲート80に連結されている。

【0025】光透過性樹脂送出機構90には、スクリュー40sが設けられ、このスクリュー40sを回転させることにより、光透過性樹脂はゲート80に送り出される。

【0026】基板側金型51には、中心部に最終的に成形基板10の中心孔10hを打ち抜いて形成するための基板中心孔打抜ピン51aが配置されている。

【0027】基板10の成形において使用するスタンパー側金型52には、基板10の情報記録層15を構成する微細凹凸12を転写するスタンパー7が例えば真空チャック方式により配置され、また、最終的に得る基板10の凹部20を形成する凸部付金型40とが配置される。

【0028】凸部付金型40には、最終的に得る基板10の所要の位置、図示の例では基板10の情報信号形成面の中心孔10hの周辺部であって、情報記録層形成領域よりも内側の位置の非情報記録領域に、全周に渡って凹部20を形成するための所要の大きさのリング状の凹部形成用凸部40aが設けられている。

【0029】そして凸部付金型40の中心部の凸部付金型40の中心孔40hに、ゲート80が連通する。また、スタンパー7の中心部には、凸部付金型40の凸部40aが挿入される中心孔7hが穿設されている。

【0030】この基板作製装置を用いて、基板10を成形する方法について説明する。

【0031】先ず、基板側金型51とスタンパー側金型52とを合致させて、両者間にキャビティ50を形成する。この状態で、光透過性樹脂、例えば溶融ポリカーボネートを、スクリュー40sを回転させることによりゲート80に送り込む。光透過性樹脂はゲート80を通過した後、凸部付金型40の中心孔40hを通じて、キャビティ50内に流し込まれると、放熱され固化する。次に、基板中心孔打抜ピン51aを押し出し突出させ、基板の中心孔10hを形成し、基板10が得られる。

【0032】このようにして、図3に示すように、基板の中心孔10hの周辺部であって、情報記録層形成領域よりも内側の位置の非情報記録領域に、凹部形成用凸部40aが転写されて凹部20が形成された基板10が成形される。

【0033】この基板10の凹部20は、基板10の中心孔の径を15(mm)とすると、その外周を例えば30(mm)、深さは、0.3(mm)以下であることが望ましく、例えば0.2(mm)に選定することができ

る。

【0034】次に、基板10上に、基板10の射出成形と同時に形成した微細凹凸12に、例えばA1蒸着膜による反射膜14を被着して情報記録層15を形成する。

【0035】次に、基板の凹部20に埋め込み閉塞する閉塞板21を用意する。基板10の凹部20は円形凹部とすることが好ましく、この場合、これを埋め込み閉塞する閉塞板21は円形状とされ、そして、図4に示すように、基板10の凹部20に、閉塞板21を嵌め込んで、合体基板25を形成する。この閉塞板21は、基板10と同じ素材、例えばポリカーボネートにより作製する。そして、閉塞板21の径は、基板10の凹部20の内周径に対応して選定され、凹部20内にちょうど嵌め込まれる大きさに選定される。また、この閉塞板21の厚さは、基板の凹部20内に嵌め込まれた状態で、その表面が基板面と同一平面を形成するように、凹部20の深さと同じか、あるいは基板の凹部20の深さよりも、わずかに大きく、従って、凹部20に嵌め込んだとき、基板面よりわずかに突出するように選定する。

【0036】次に、図5に示すように、基板10の中心部、すなわちこの場合、基板10の凹部20に嵌め込まれた閉塞板21の中心上に、ノズル9により、液状の光硬化性樹脂3を滴下する。

【0037】次に、図6に示すように、基板10を高速回転し、液状光硬化性樹脂3を延伸する。このとき、基板10の回転による液状光硬化性樹脂3の延伸と同時に、光源22による紫外線照射により、液状光硬化性樹脂3の光硬化を行い、最終的に得られる光透過層18を作製することができる。

【0038】このように、基板10の凹部20に閉塞板21を嵌め込んだ構成としたことにより、基板10の中心部から、光硬化性樹脂3を滴下することができるようになり、これにより、上記の図22において説明した測定結果において示したように、光透過層18の厚さを均一に形成することができる。

【0039】次に、図7に示すように、中心孔打ち抜き機71を、基板10の中心部から挿入して、閉塞板21および光硬化性樹脂3を光硬化させて形成した光透過層18および閉塞板21を打ち抜き、貫通させて、基板10の中心孔10hを形成して、最終的に目的とする光学記録媒体を得ることができる。

【0040】また、基板10の中心孔10hを基板10の中心部を貫通させて形成する場合には、図8に示すように、基板10の光透過層18形成面側から、中心孔打ち抜き機71を打ち込み、光透過層18および閉塞板を打ち抜き、貫通させて、基板10の中心孔10hを形成することもできる。

【0041】上述のようにして、光透過層18の作製工程において、基板10の中心孔10hを閉塞板21により閉塞させた状態で光硬化性樹脂3を塗布し、回転延伸

させ、光硬化する方法を探ることにより、情報記録層15からの情報の読み出しあるいは書き込みを行う光透過層18の厚さ分布の極めて小さい光学記録媒体を作製することができる。

【0042】次に、光透過層の厚さ分布の極めて小さい、すなわち均一な厚さの光学記録媒体を作製する他の実施例について、図9～図15を参照して説明する。

【0043】図9に本発明の光学記録媒体の製造装置の概略図を示す。この光学記録媒体の製造装置は、基板の中心孔に貫通する中心軸101を有し、この中心軸を中心として水平方向に回転機能を有する水平基台100と、基板の中心孔10hを閉塞する閉塞板121と、この閉塞板121を基板10から脱着可能な電磁石102と、光硬化性樹脂を硬化するためのランプLからなる。

【0044】この閉塞板121は、基板の中心孔10hの内径より大なる外径を有し、その下面に中心孔10hに挿入される突出支持部121aが設けられて成る。閉塞板121または突出支持部121aは、少なくともいずれか一方の少なくとも一部が磁性体によって構成される。例えば閉塞板121は磁性金属板によって構成するとか、例えば射出成形で作製した樹脂板に磁性材料を塗布して構成することができる。この閉塞板121は、その厚さを0.3mm程度以下、好ましくは0.1mm以下とする。

【0045】また、この電磁石102と、基板10上に液状光硬化性樹脂を滴下するノズル9とは、図15に示すように、交換可能な構成とされている。

【0046】例えば、ノズル9と電磁石102とは、回転軸部131上に一体に回転させる構造として、ノズル9と電磁石102とが、交代して基板10の中心部に持ち来されるようにする。一方、複数の基板10が搬送手段130によって搬送されるようになれる。

【0047】また、ランプLの形状は、円形、線形のいずれの形状のものも使用することができる。このランプLは、閉塞板121よりも基板10の外周側に配置されており、基板10の最外周部にも充分光照射が可能な位置に配置されている。

【0048】上述の本発明装置を用いて光学記録媒体を作製する。先ず、図10に示すように、1つの基板10が情報記録層を上にして水平基台100の上方に搬送手段130によって搬送されて来る。そして、水平基台100が上昇し、その中心軸101が基板10の中心孔10h中に挿入されると共に、図示しないが、水平基台100に設けられている真空チャックにより基板10が水平基台100上に吸着載置される。

【0049】一方、このとき、電磁石102に吸着された閉塞板121が水平基台100上の基板10の中心部の上方に持ち来されていて、その突出支持部121aが基板の中心孔10h内に挿入されると共に、閉塞板121が、基板の中心孔10hの上端面に衝合してこれを閉

塞する。そして、この閉塞がなされた状態で電磁石102への通電が断たれ、閉塞板121が基板10の中心孔10hを閉塞した状態で合体し、合体基板125が構成される。

【0050】次に、図11に示すように、電磁石102を移動させ、代わりに光硬化性樹脂を供給するノズル9を基板10の上方に設置して、合体基板125の中心部にノズル9から光硬化性樹脂を滴下する。

【0051】その後、ノズル9を移動させて代わりに再び電磁石102を基板10の上方に設置する。

【0052】次に、図12に示すように、この合体基板125上に滴下した光硬化性樹脂を、合体基板125を回転基台100を回転することによって、一様に延伸塗布する。

【0053】その後、図13に示すように、合体基板125の回転中に閉塞板121を電磁石102によって吸着して、合体基板125から取り外す。

【0054】次に、図14に示すように、光硬化性樹脂をランプLにより光硬化して、最終的に得られる光学記録媒体を構成する光透過層を形成する。

【0055】上述した工程は、図15で説明したように基板10を搬送手段130によって順次水平基台100上に持ち来すことによって連続して繰り返し行うことができる。そして、上述の構成によれば、光硬化性樹脂を供給滴下するノズル9と、閉塞板121の吸着および脱着を行う電磁石102とは、一体に回転する構造したことにより迅速に基板10の中心部上に移動交代することができる。

【0056】上述の実施例において、図9に示した閉塞板121は、例えば厚さ0.3mm程度の金属板や、光硬化性樹脂を射出成形することにより作製した樹脂板に磁性粉を塗布したものを用いることができるが、この閉塞板121は繰り返し使用する必要があるため、繰り返し使用に耐えられる強度が要求される。このため、この閉塞板121をある程度厚くすることが必要になる。

【0057】そこで、図16に示すように、基板10の中心部周辺に予め凹部10aを形成しておくと、図17に示すように、基板10と閉塞板121を合致させて合体基板を形成したときにも閉塞板121が基板から突出しすぎることを回避できるので、ある程度厚い閉塞板121を用いることができる。但し、この場合、この基板の凹部10aの深さは閉塞板121の厚さよりも浅く選定されていることが好ましい。例えば基板10の厚さを1.2mmとし、基板凹部10aの深さを0.3mmとすると、閉塞板121の厚さを0.4mm程度にすることができる。

【0058】また、上述した実施例において、図18に示すように、閉塞板121と基板10との接触部にオリソング、あるいはパッキングを取り付けることにより、基板10と閉塞板121との間に光硬化性樹脂が侵入する

ことを防止することができ、これにより光硬化性樹脂の塗布むらや最終的に得られる光学記録媒体の外観不良を回避することができる。

【0059】また、図19に示すように、閉塞板121の側面をテーパー状にし、基板10の中心孔10hを埋め込んだときに、基板の中心孔10hの側壁部と線接触させた状態とすると、基板10と閉塞板121との間に隙間がないため、光硬化性樹脂の侵入を回避することができる。

【0060】本発明の光学記録媒体を構成する情報記録層15の反射膜14は、上述の実施例においては、A1蒸着膜により形成したが、本発明は、この例に限定されるものではなく、Au等の金属も適用することができる。

【0061】また、上述した実施例においては、単層構造の光学記録媒体を作製する場合について説明したが、本発明は、上述の基板10上に光硬化性樹脂3を塗布した後に情報記録層を構成する微細凹凸転写用のスタンパーを合致させる工程を追加して、その後、さらに上述した実施例と同様に光透過層を形成させることにより、2層構造、あるいはそれ以上情報記録層を有する多層構造の光学記録媒体を作製する場合においても、適用することができる。

【0062】

【発明の効果】本発明によれば、光学記録媒体の情報記録層からの記録情報の読み出し、あるいは情報の書き込みを行う光透過層を液状光硬化性樹脂を光硬化させることにより形成する場合に、基板の中心に滴下して回転延伸させる工程を経て形成させることができるために、光透過層を薄く、かつ均一な厚さに形成することができ、光学記録媒体の高記録密度化を図ることができた。

【0063】また、基板の回転により液状の光硬化性樹脂を延伸させると同時に光照射により光硬化性樹脂を硬化させることにより、光硬化性樹脂がその表面張力により最終的に得られる光透過層の厚さに分布が生じることを効果的に回避することができた。

【0064】また、基板の凹部の外周を、基板上に形成された情報記録層を構成する微細凹凸の最内周よりも内側に形成することにより、情報記録層に欠陥を生じることを回避することができた。

【0065】また、基板の凹部を埋め込むための閉塞板の厚さを、基板の凹部の深さと略同一か、あるいは凹部の深さよりも厚く形成させることにより、基板に閉塞板を埋め込んだ状態において、基板の中心部が窪んだ状態となることを回避することができ、これにより、液状光硬化性樹脂を塗布、延伸する際に、液状光硬化性樹脂が基板中心部に溜まり、延伸が妨げられる状態となることを回避することができた。

【0066】また、基板の凹部の深さを0.3(mm)以下に選定することにより、基板の凹部を埋め込む閉塞

板21の厚さを薄く設定することができ、これにより、基板の中心孔を容易に打ち抜けるようにすることができた。

【0067】また、基板の中心孔に嵌め込み、これを閉塞する閉塞板として磁性を有する材料を用いて合体基板の回転中に閉塞板の脱着を行うことにより、光学記録媒体の作製工程をより簡易かつ迅速に行うことができるようになった。

【0068】また、本発明の光学記録媒体の製造装置によれば、光学記録媒体を構成する光透過層を、薄くかつ均一な厚さに、簡易かつ迅速に形成することができた。

【図面の簡単な説明】

【図1】本発明方法により作製した光学記録媒体の概略断面図を示す。

【図2】基板作製装置の概略図を示す。

【図3】基板の概略断面図を示す。

【図4】合体基板の作製工程図を示す。

【図5】光透過層の作製工程図を示す。

【図6】光透過層の作製工程図を示す。

【図7】基板の中心孔を打ち抜き作製する工程図を示す。

【図8】基板の中心孔を打ち抜き作製する他の例の工程図を示す。

【図9】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図10】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図11】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図12】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図13】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図14】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図15】本発明方法による光学記録媒体の製造装置の概略図を示す。

【図16】本発明方法による光学記録媒体の他の例の製造工程図を示す。

【図17】本発明方法による光学記録媒体の他の例の製造工程図を示す。

【図18】本発明方法による光学記録媒体の他の例の製造工程図を示す。

【図19】本発明方法による光学記録媒体の他の例の作製工程図を示す。

【図20】従来方法により作製した光学記録媒体の概略断面図を示す。

【図21】従来方法による光学記録媒体の一製造工程図を示す。

【図22】光硬化性樹脂の塗布開始位置の基板中心から

の距離と、光透過層の厚さとの関係図を示す。

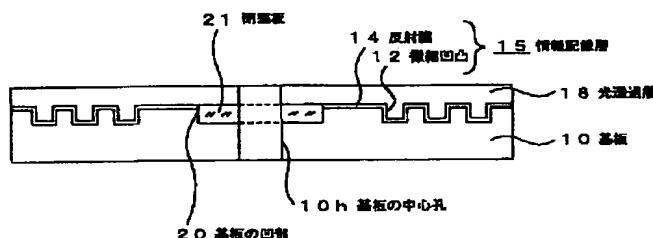
【図23】光硬化性樹脂を回転延伸させる際の基板の回転パターンを示す。

【符号の説明】

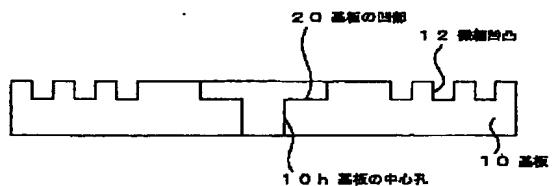
1, 10 基板、1 h, 10 h 基板の中心孔、2, 1
2 微細凹凸、3 光硬化性樹脂、4, 14 反射膜、
5, 15 情報記録層、7 スタンパー、7 h スタンパー
の中心孔、8, 18 光透過層、9 ノズル、20
基板の凹部、21, 121 閉塞板、22 光源、2
5, 125 合体基板、31 光硬化性樹脂の塗布開始
位置が5 (mm) のときの光透過層の厚さの分布、32
光硬化性樹脂の塗布開始位置が10 (mm) のときの
光透過層の厚さの分布、33 光硬化性樹脂の塗布開始

位置が15 (mm) のときの光透過層の厚さの分布、34
光硬化性樹脂の塗布開始位置が20 (mm) のときの
光透過層の厚さの分布、35 光硬化性樹脂の塗布開始
位置が25 (mm) のときの光透過層の厚さの分布、40
凸部付金型、40 a 凹部形成用凸部、40 h 凸
部付金型の中心孔、40 s スクリュー、50 キャビ
ティ、51 基板側金型、51 a 基板中心孔打抜ビ
ン、52 スタンパー側金型、53 金型装置、70,
71 中心孔打抜き機、80 ゲート、90 光透過
性樹脂送出機構、100 水平基台、101 中心軸、
102 電磁石、121 a 突出支持部、130 搬送
手段、131 回転軸部

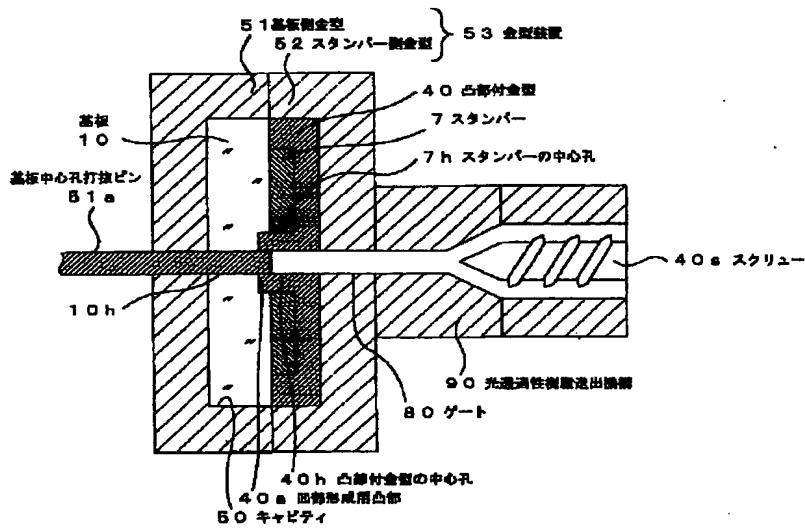
【図1】



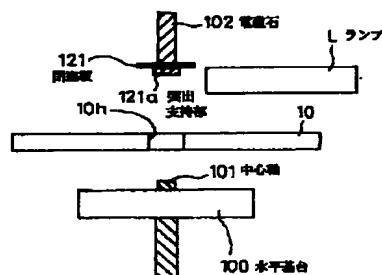
【図3】



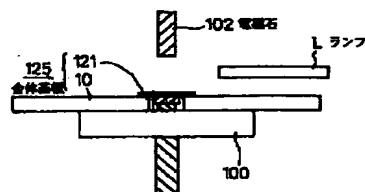
【図2】



【図9】



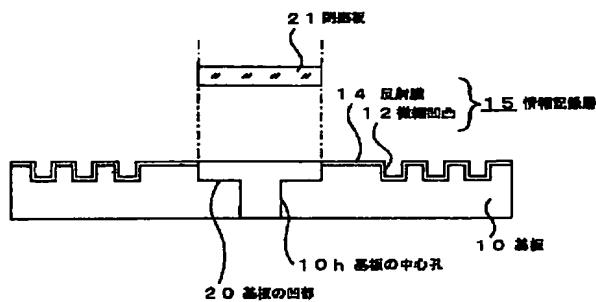
【図10】



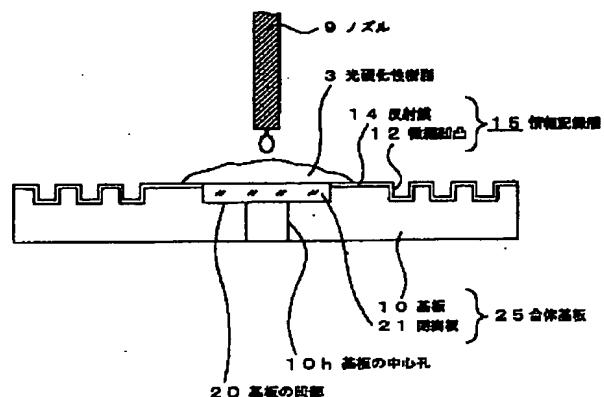
【図18】



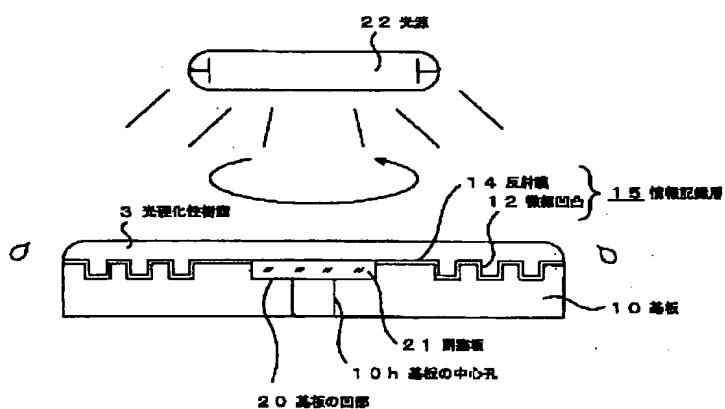
【図4】



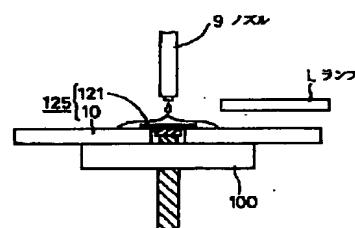
【図5】



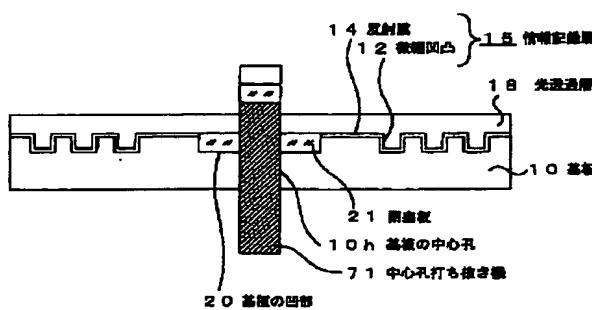
【図6】



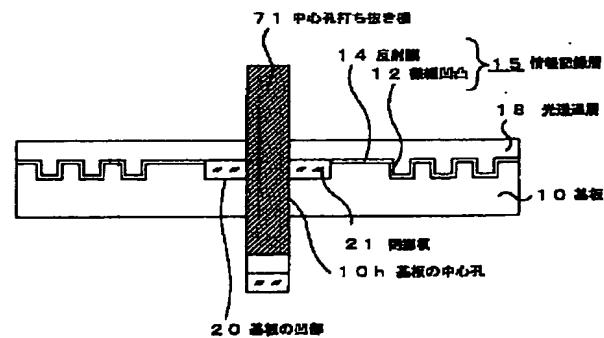
【図11】



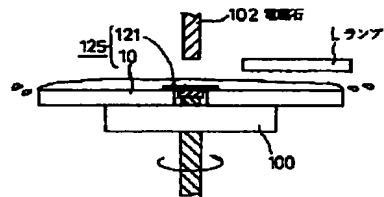
【図7】



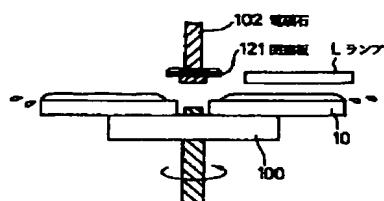
【図8】



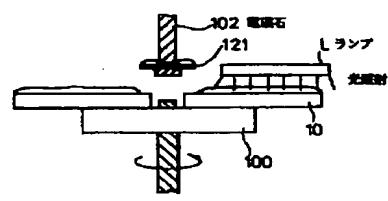
【図12】



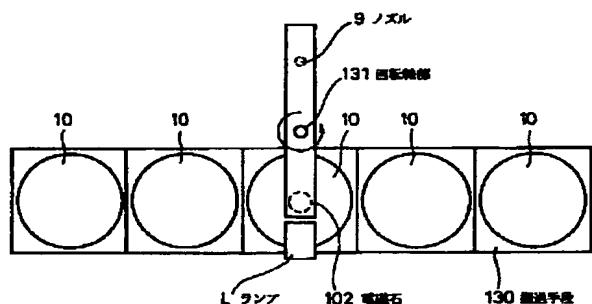
【図13】



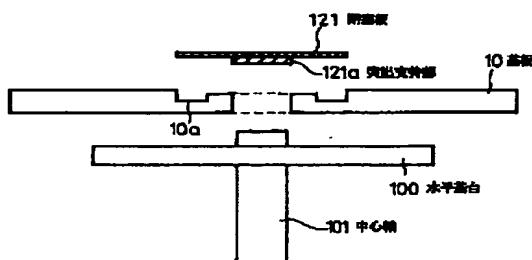
【図14】



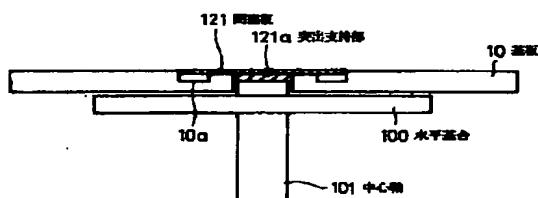
【図15】



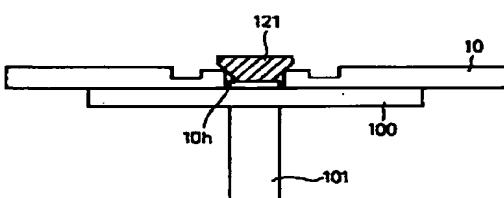
【図16】



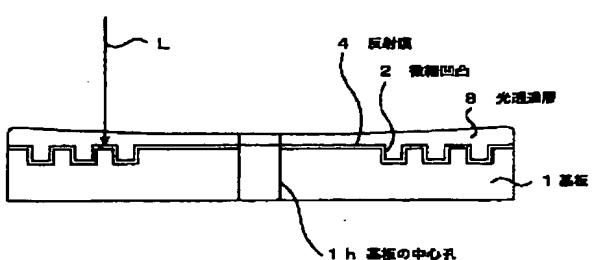
【図17】



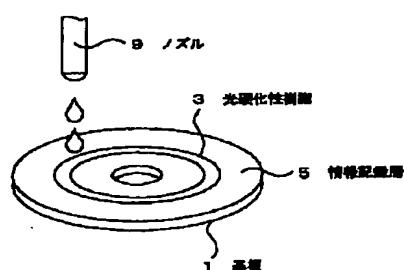
【図19】



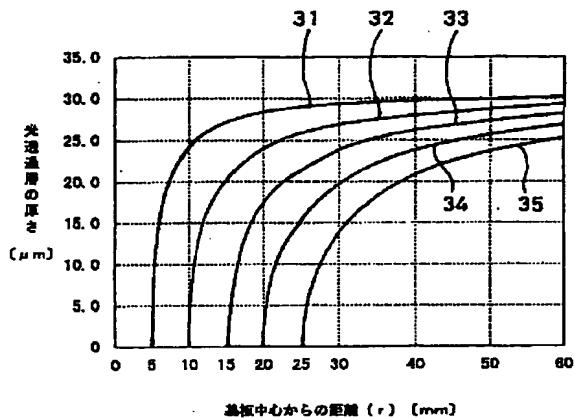
【図20】



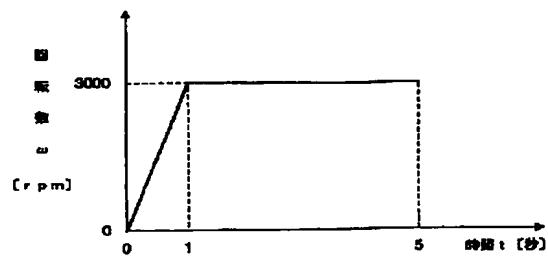
【図21】



【図22】



【図23】



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